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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/006,462	12/04/2001	Steven R. Walther	V0077/7165WRM	5689

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EXAMINER

CROWELL, ANNA M

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 09/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/006,462	WALTHER, STEVEN R.	
	Examiner	Art Unit	
	Michelle Crowell	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 July 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) 6-9, 15-17 and 28-33 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 10-14, and 18-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Foster et al. (U.S. 5,567,243).

Referring to Figure 1 and column 4, line 32-column 5, line 33, Liebert et al. discloses a plasma doping apparatus comprising: a plasma doping chamber 10; a platen 14 located in the plasma doping chamber for supporting a workpiece 20 (col. 4, lines 32-36); an anode 24 spaced apart from the platen in the plasma doping chamber (col.4, lines 44-46); a process gas source 36 coupled to the plasma doping chamber, wherein a plasma containing ion of the process gas is produced in a plasma discharge region between the anode and the platen (col.5, lines 4-8); a pulse source 30 for applying pulses between the platen and the anode for accelerating ions from the plasma into the workpiece (col.4, lines 50-57, col.5, lines 22-33).

Liebert et al. fails to teach a mechanism for rotating the workpiece with rotational speed in a range of about 10-600 rpm for averaging azimuthal uniformity variations over the surface of the workpiece.

Referring to Figure 2 and column 12, line 36-column 14, line 48, Foster et al. discloses a plasma processing apparatus comprising a mechanism for rotating the platen 46 such that the

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workpiece 48 rotates about its center at a rotational speed between 0-2000 rpm to ensure uniform processing and desired processing rate (col. 13, lines 49-65, col. 8, lines 23-25). Additionally, plasma is pumped down to the substrate by using a rotating platen (col.4, lines 30-31). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the platen of Liebert et al. with a rotating mechanism that rotates at speeds in a range between 0-2000 rpm in order to pump the plasma down to the substrate and achieve uniform processing at the desired processing rate. Additionally, it should be noted that since the plasma is non-uniform in the apparatus of Liebert et al. in view of Foster et al., rotating the workpiece ensures that all of the exposed workpiece surface is processed by the entire non-uniform plasma environment, and thus achieve uniform doping or "averaging azimuthal uniformity variations" on the workpiece. Furthermore, with respect to the claimed limitations of "averaging azimuthal uniformity variations", it should be noted that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function.

With respect to claim 3, the pulse source of Liebert et al. has a pulse rate of 100 Hz to 2 kHz which is capable of operating at a faster rate than the rotational speed of Foster et al. at 0-2000 rpm.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 5 is rejected under 35 U.S.C. 102(b) as being anticipated by Nakayama et al.

(Japanese Patent Publication 01-022027).

Referring to Drawing 1 and the abstract, discloses a plasma doping apparatus comprising: a plasma doping chamber 1 containing a platen 4a for supporting a workpiece 6; a plasma source 10 for generating a plasma in the plasma doping chamber and for accelerating ions from the plasma into the workpiece; and a drive mechanism for rotating the workpiece. Additionally, it should be noted that since the plasma is non-uniform in the apparatus of Nakayama et al., rotating the workpiece ensures that all of the exposed workpiece surface is processed by the entire non-uniform plasma environment, and thus achieve uniform doping or “averaging azimuthal uniformity variations” on the workpiece. Furthermore, with respect to the claimed limitations of “averaging azimuthal uniformity variations”, it should be noted that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function.

5. Claims 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Hirata (Japanese Patent Publication 57-023227).

Referring to Figure 1 and column 4, line 32-column 5, line 33, Liebert et al. discloses a plasma doping apparatus comprising: a plasma doping chamber 10; a platen 14 located in the plasma doping chamber for supporting a workpiece 20 (col. 4, lines 32-36); an anode 24 spaced apart from the platen in the plasma doping chamber (col.4, lines 44-46); a process gas source 36 coupled to the plasma doping chamber, wherein a plasma containing ion of the process gas is

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produced in a plasma discharge region between the anode and the platen (col.5, lines 4-8); a pulse source 30 for applying pulses between the platen and the anode for accelerating ions from the plasma into the workpiece (col.4, lines 50-57, col.5, lines 22-33).

Liebert et al. fails to teach an anode having a spacing from the platen that varies over the area of the anode, wherein the anode comprises two or more anode elements and actuators for individually adjusting the spacing between the anode and the platen.

Referring to Drawings 3, 4, 5, and 10 and the abstract, Hirata teaches a plasma processing apparatus wherein the anode comprises two or more anode elements 9, 10, 11 and actuators 15, 16, 17 for individually adjusting the spacing between the anode elements 9, 10, 11 and the platen 3 in order to obtain an uniform processing rate. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the anode of Liebert et al. to have a spacing from the platen that varies over the area of the anode, and wherein the anode comprises two or more anode elements and actuators for individually adjusting the spacing between the anode and the platen as taught by Hirata in order to achieve an uniform processing rate.

Liebert et al. fails to teach that the two or more anode elements comprise annular rings.

Referring to Drawings 5 and 10, Hirata teaches a plasma processing apparatus wherein the two or more anode elements comprises an alternate shape of annular rings 74, 75, 76. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the anode elements to be annular rings as taught by Hirata since this a known alternative configuration for plasma processing anodes. Additionally, the shape (annular rings) of the claimed anode elements is considered a matter of choice which a person of ordinary skill in the

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art would have found obvious absent persuasive evidence that the particular shape of the claimed anode elements are significant.

6. Claims 18-20, 22-25 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Setoyama et al. (U.S. 6,196,155).

Referring to Figure 1 and column 4, line 32-column 5, line 33, Liebert et al. discloses a plasma doping apparatus comprising: a plasma doping chamber 10; a platen 14 located in the plasma doping chamber for supporting a workpiece 20 (col. 4, lines 32-36); an anode 24 spaced apart from the platen in the plasma doping chamber (col.4, lines 44-46); a process gas source 36 coupled to the plasma doping chamber, wherein a plasma containing ion of the process gas is produced in a plasma discharge region between the anode and the platen (col.5, lines 4-8); a pulse source 30 for applying pulses between the platen and the anode for accelerating ions from the plasma into the workpiece (col.4, lines 50-57, col.5, lines 22-33).

Liebert et al. fails to specifically teach that the chamber having a cylindrical geometry.

Referring to column 2, lines 25-26, Setoyama et al. teaches a plasma processing apparatus having a chamber with a cylindrical geometry. It is conventionally known in the art for a chamber to have a cylindrical geometry. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to for the chamber of Liebert et al. to have a cylindrical geometry since this feature is conventionally known in the art.

Liebert et al. fails to teach a plurality of magnetic elements disposed around the plasma discharge region

Referring to Figure 1 and column 4, line 52-column 6, line 49, Setoyama et al. teaches a plasma processing apparatus having a plurality of magnetic elements 20a and 20b disposed around the plasma discharge region for efficiently confining the plasma for processing and easily maintaining the plasma density (col.6, lines 1-4). Additionally, the magnetic elements are disposed on or near the anode 9. Furthermore, the magnetic elements are arranged in one or more annular rings (col. 5, lines 1-2). Moreover, the magnetic elements 20a and 20b have alternating polarities facing the plasma discharge region (col. 5, lines 1-6). Also, the magnetic elements 20b are arranged in a cylindrical array around the plasma discharge region (col. 5, lines 4-6). In addition, the magnetic elements produce cusp magnetic fields 30 in a region adjacent to the plasma discharge region (see Fig. 1). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Liebert et al. with the magnetic elements disposed around the plasma discharge region as taught by Setoyama et al. in order to efficiently confine the plasma for processing and to easily maintain the plasma density

7. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Setoyama et al. (U.S. 6,196,155) as applied to claims 18-20, 22-25 and 27 above, and further in view of Shan et al. (U.S. 6,022,446).

The teachings of Liebert et al. in view of Setoyama et al. have been discussed above.

Liebert et al. in view of Setoyama et al. fail to teach magnetic elements which are radially aligned to form a spoke configuration.

Referring to Figure 4a and column 8, lines 23-49, Shan et al. teaches a plasma processing

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apparatus wherein the magnetic elements 90 are radially aligned to form a spoke configuration. With this spoke configuration, a radially symmetrical magnetic field is generated to enhance processing rates. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to arrange the magnetic elements of Liebert et al. in view of Setoyama et al. in a spoke configuration as taught by Shan et al. since a radially symmetrical magnetic field is generated to enhance processing rates.

8. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Setoyama et al. (U.S. 6,196,155) as applied to claims 18-20, 22-25 and 27 above, and further in view of Goeckner et al. (U.S. 6,182,604).

The teachings of Liebert et al. in view of Setoyama et al. have been discussed above.

Liebert et al. in view of Setoyama et al. fail to teach a hollow electrode surrounding the plasma discharge region.

Referring to Figure 2a-b and column 5, line 26-column 6, line 6, Goeckner et al. teaches a plasma doping apparatus which uses a hollow electrode 300 surrounding the plasma discharge region in order to produce a more uniform plasma at a lower gas pressure. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Liebert et al. in view of Setoyama et al. with a hollow electrode surrounding the plasma discharge region as taught by Goeckner et al. in order to produce a more uniform plasma at a lower gas pressure. Additionally, the apparatus of Liebert et al. in view of Setoyama et al. and Goeckner et al. is capable of positioning magnetic elements near the hollow electrode.

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9. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Setoyama et al. (U.S. 6,196,155) as applied to claims 18-20, 22-25 and 27 above, and further in view of Little et al. (U.S. 4,443,488).

The teachings of Liebert et al. in view of Setoyama et al. have been discussed above.

Liebert et al. in view of Setoyama et al. fail to teach a hollow electrode surrounding the plasma discharge region.

Referring to Figure 1 and column 2, line 55-column 4, line 46, Little et al. teaches a plasma processing apparatus which uses a hollow electrode 22 surrounding the plasma discharge region 12, wherein magnetic elements 30 are disposed near the hollow electrode in order to produce a large volume, low pressure, high temperature plasma yielding very high energy, charged ions. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Liebert et al. in view of Setoyama et al. with a hollow electrode surrounding the plasma discharge region as taught by Goeckner et al. in order to produce a large volume, low pressure, high temperature plasma yielding very high energy, charged ions.

Response to Arguments

10. Applicant's arguments filed July 12, 2004 have been fully considered but they are not persuasive.

Applicant has argued that since Foster et al. is directed to CVD processes in which a film is deposited on a substrate, a process for rotating the workpiece which averages azimuthal uniformity variations is not suggested because the invention is a plasma doping processing.

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Applicant further argued that CVD and doping are unique and different processes. However, both CVD processing and doping are analogous art since they both solve problems in the field of plasma processing. Additionally, the only difference between a doping apparatus and a CVD apparatus is the type of gas used during processing and thus the apparatus of Liebert et al. could be used as a CVD apparatus or the apparatus of Foster et al. could be used as a doping apparatus simply by changing the process gases (i.e. depositing gases, doping gases). Furthermore, in plasma processing systems it is well known that the plasma distribution is non-uniform. One way of compensating for the non-uniformity is to rotate the workpiece which allows all of the workpiece surface to be processed by the whole non-uniform plasma environment and therefore achieve an uniform process (i.e. depositing or doping) or “averages azimuthal uniformity variations” on the workpiece. Lastly, a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed (**i.e. a process for rotating the workpiece which averages azimuthal uniformity variations**) does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim.

With respect to the arguments relating to the Hirata reference, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., **varying and adjusting the spacing between an anode and platen for accelerating ions from the plasma into the workpiece**) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

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With respect to the arguments relating to the Setoyama et al. and Shan et al. references, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the magnetic elements **control the radial density distribution of the plasma so that the dose uniformity of the ions implanted into the workpiece is improved.**) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. **Yang '282, Freytsis et al. '427, Vesnovsky et al. '481, and Ryding et al. '221 teach a plasma doping apparatus having a rotatable platen.**

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (703) 305-1956. The examiner can normally be reached on M-F (8:00 - 4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

AMC *Wme*


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